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Docket No.: WMP-IFT-823

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By: _____ Date: November 18, 2006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Before the Board of Patent Appeals and Interferences

Applic. No.	:	10/675,050	Confirmation No.: 5870
Inventor	:	Zenko Gergintschew	
Filed	:	September 30, 2003	
Title	:	Method for Driving a Semiconductor Switch and Circuit Configuration with a Semiconductor Switch	
TC/A.U.	:	2836	
Examiner	:	Dharti H. Patel	
Customer No.	:	**24131**	

MAIL STOP: **APPEAL BRIEF-PATENTS**
Hon. Commissioner for Patents
Alexandria, VA 22313-1450

APPEAL BRIEF

Sir:

This is an appeal from the final rejection in the Office action dated June 16, 2006, finally rejecting claims 1-6.

Appellants submit this *Appeal Brief*, including payment in the amount of $500.00 to cover the fee for filing the *Appeal Brief*.

Real Party in Interest:

This application is assigned to Infineon Technologies AG of Munich, Germany. The assignment will be submitted for recordation upon the termination of this appeal.

Related Appeals and Interferences:

No related appeals or interference proceedings are currently pending which would directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

Status of Claims:

Claims 1-6 are rejected and are under appeal. Claims 1-8 remain in the application.

Status of Amendments:

No claims were amended after the final Office action.

Summary of the Claimed Subject Matter:

Independent claim 1 of the instant application recites a method for driving a semiconductor switch (T) having load current (Ids) limiting and thermal protection, a maximum load current being limited and the semiconductor switch switching off upon a predetermined upper temperature (TS1) being exceeded and switching on again when a chip temperature falls below a predetermined lower temperature (TS3) (see page 1, lines 8-13), which comprises the steps of:

operating the semiconductor switch (T) in one of a normal mode and a fault mode (page 13, line 22 to page 14, line 2);

operating the semiconductor switch in the fault mode upon exceeding the predetermined upper temperature (TS1) (page 13, lines 22-24 and Figs. 3A and 4A); and

limiting a load current (Ids) to a first maximum value (IS1) in the normal mode and to a second maximum value (IS2), being lower than the first maximum value (IS1), in the fault mode (page 14, lines 4-15 and Figs. 3B and 4B).

Independent claim 6 of the instant application recites a circuit configuration, comprising:

a semiconductor switch (T) having a drive terminal (G) and a load path (D-S) (see Figs. 5-6);

a protective circuit (20) connected to said drive terminal (G) of said semiconductor switch (T) (see Figs. 5-6);

a temperature sensor (10) disposed in a region of said semiconductor switch (T) and coupled to said protective circuit (20), said temperature sensor (10) providing a temperature measuring signal (TS) fed to said protective circuit (20) (see page 17, lines 16-20 and Figs. 5-6); and

a current measuring configuration (40) coupled to said protective circuit (20) and generating a current measuring signal (IS) being dependent on a current across

said load path (D-S) of said semiconductor switch (T) (see page 18, lines 1-4 and Figs. 5-6);

said protective circuit (20) storing first and second overcurrent signals (IS1, IS2), said protective circuit assuming one of a first operating mode and a second operating mode, and, depending on a mode, said protective circuit controlling said semiconductor switch according to a comparison of the current measuring signal to the first overcurrent signal (IS1) or according to a comparison of the current measuring signal to the second overcurrent signal (IS2) (see page 18, line 19 to page 19, line 8 and Figs. 3B, 4B, and 5-6).

References Cited:

US Patent No. 6,781,357	Balakrishnan	Aug. 24, 2004
US Patent No. 6,052,268	Thomas	Apr. 18, 2000
US Patent No.5,757,203	Brown	May 26, 1998

Grounds of Rejection to be Reviewed on Appeal

1. Whether or not claims 1-4 are unpatentable over the acknowledged prior art in view of Balakrishnan et al. under 35 U.S.C. § 103 (a).

2. Whether or not claim 5 is unpatentable over acknowledged prior art in view of Balakrishnan et al. and Thomas under 35 U.S.C. § 103 (a).

3. Whether or not claim 6 is unpatentable over the acknowledged prior art in view of Brown under 35 U.S.C. § 103 (a).

Argument:

Claims 1-4 are patentable over the acknowledged prior art in view of Balakrishnan et al. under 35 U.S.C. § 103 (a)

In item 1 on pages 2-4 of the final Office Action, claims 1-4 have been rejected as being unpatentable over Appellant's Acknowledged Prior Art (hereinafter AAPA) in view of Balakrishnan et al. (hereinafter Balakrishnan) under 35 U.S.C. § 103(a).

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful. Claim 1 calls for,

> A method for driving a semiconductor switch having load current limiting and thermal protection, a maximum load current being limited and the semiconductor switch switching off upon a predetermined upper temperature being exceeded and switching on again when a chip temperature falls below a predetermined lower temperature, which comprises the steps of:
>
> operating the semiconductor switch in one of a normal mode and a fault mode;
>
> operating the semiconductor switch in the fault mode upon exceeding the predetermined upper temperature; and
>
> limiting a load current to a first maximum value in the normal mode and to a second maximum value, being lower than the first maximum value, in the fault mode.

Claim 1 of the instant application thus relates to a method for driving a semiconductor switch having load current limiting functionality and thermal protection. Due to the current limiting functionality, a maximum load current of the semiconductor switch is limited to a given maximum current value, and due to the thermal protection the semiconductor switch is switched off if a temperature exceeds a predetermined upper temperature, and is switched on again if a chip temperature falls below a predetermined lower temperature. The semiconductor switch may be operated in one of a normal mode and a fault mode.

According to claim 1, the semiconductor switch operates in fault mode after the temperature has exceeded the predetermined upper temperature. The load current of the semiconductor switch is:

a. limited to a first maximum value in the normal mode, and

b. to a second maximum value, being lower than the first maximum value, in the fault mode.

In addition, claim 1 recites "operating the semiconductor switch in the fault mode upon exceeding the predetermined upper temperature."

The Examiner's argumentation that such a method, taking AAPA and Balakrishnan into account was obvious to one skilled in the art, is not convincing from Appellant's point of view.

The Balakrishnan reference discloses a method and apparatus for maintaining a constant load current with line voltage in a switch mode power supply. According to Fig. 1 of the reference, a power MOSFET is connected to an oscillator generating three signals 10, 15, 20 with different waveforms. A comparator modulates the duty cycle. A search of the Balakrishnan patent reveals that the word "temperature" does not appear anywhere in the patent.

According to the AAPA disclosed in Figs. 1 and 2 of the instant application, a load current of a semiconductor switch is limited to a given maximum value (Ids1). Furthermore, the semiconductor switch is switched off if a chip temperature exceeds an upper temperature value (Tso), and is switched on again if the chip temperature falls below a given lower chip

temperature.

In contrast to the method recited in claim 1 of the instant application, the prior art method does not include operating the semiconductor switch in one of a normal mode and a fault mode. The Examiner's opinion that in the prior art method the semiconductor switch is in a normal mode when switched on and is in a fault mode when switched off, is not correct.

Assuming that the semiconductor switch is switched on in the normal mode and is switched off in the fault mode, there would be no need to provide a second maximum value for the fault mode. Thus, even a combination of the AAPA and Balakrishnan does not result in the method of claim 1.

Furthermore, the Examiner has stated that it would have been obvious to combine the teachings of temperature sensing in AAPA with Balakrishnan because "a rise in current normally accompanies rise in temperature." However, since Balakrishnan has nothing to do with temperature, the required hint or suggestion in the prior art for making a proper combination is missing.

In summary, the present invention pertains to a method for driving a semiconductor switch, which can be operated in a fault mode or a normal mode, and in which the maximum allowed current in the fault mode is limited to a lower threshold value than in the normal mode. Balakrishnan describes in reference to Fig. 1 a switch in which a current is limited by a MOSFET 2 to a value dependent on the input voltage (see column 3, lines 47-53). In the AAPA, the semiconductor switch limits the load current to a single default threshold value. Therefore, Appellant believes that a combination of Balakrishnan and AAPA does

not lead a person skilled in the art to the method according to claim 1 of the instant application since Balakrishnan does not have a switch that can accept two different operating conditions with two different current thresholds.

The Examiner's argumentation with regard to claim 1 is therefore respectfully believed to be unreasonable from Appellant's point of view and therefore claim 1 and its dependent claims 2-4 are believed to patentable over AAPA in view of Balakrishnan.

Claim 5 is patentable over the acknowledged prior art in view of Balakrishnan et al. and Thomas under 35 U.S.C. § 103 (a)

In item 2 on pages 4-5 of the final Office Action, claim 5 has been rejected as being unpatentable over AAPA in view of Balakrishnan and Thomas under 35 U.S.C. § 103(a).

Since claim 1 is believed to be patentable as discussed above and claim 5 is dependent on claim 1, it is believed to patentable as well.

Claim 6 is patentable over the acknowledged prior art in view of Brown under 35 U.S.C. § 103 (a)

In item 3 pages 5-6 of the final Office Action, claim 6 has been rejected as being obvious over AAPA in view of Brown under 35 U.S.C. § 103(a).

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful. Independent claim 6 calls for,

> A circuit configuration, comprising:
>
> > a semiconductor switch having a drive terminal and a load path;
> >
> > a protective circuit connected to said drive terminal of said semiconductor switch;

a temperature sensor disposed in a region of said semiconductor switch and coupled to said protective circuit, said temperature sensor providing a temperature measuring signal fed to said protective circuit; and

a current measuring configuration coupled to said protective circuit and generating a current measuring signal being dependent on a current across said load path of said semiconductor switch;

said protective circuit storing first and second overcurrent signals, said protective circuit assuming one of a first operating mode and a second operating mode, and, depending on a mode, said protective circuit controlling said semiconductor switch according to a comparison of the current measuring signal to the first overcurrent signal or according to a comparison of the current measuring signal to the second overcurrent signal.

As stated above, claim 6 has been rejected over a combination of AAPA and Brown. Brown relates to multiple on-chip IDDQ monitors. The Brown device appears to having nothing to do with the subject matter of the instant application. Brown also does not contain the word "temperature." Furthermore, the argumentation given above with respect to AAPA in view of Balakrishnan holds true for AAPA in view of Brown as well. More specifically, AAPA and Brown do not show a semiconductor switch which is in a normal mode when switched on and is in a fault mode when switched off as well as a temperature sensor disposed in a region of a semiconductor switch and coupled to the protective circuit, the temperature sensor providing a temperature measuring signal fed to the protective circuit, as recited in claim 6.

Claim 6 is thus also believed to be patentable over the prior art of record.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claims 1 or 6. Claims 1 and 6 are,

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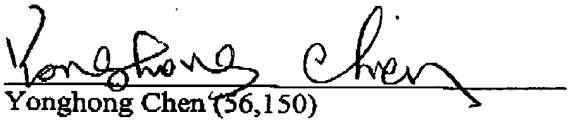
therefore, believed to be patentable over the art. The dependent claims are believed to be patentable as well because they all are ultimately dependent on claims 1 or 6.

The honorable Board is therefore respectfully urged to reverse the final rejection of the Primary Examiner.

If an extension of time is required for this submission, petition for extension is herewith made. Any fees due should be charged to Deposit Account No. 12-1099 of Lerner Greenberg Stemer LLP.

Respectfully submitted,



Yonghong Chen (56,150)

Date: November 18, 2006
Lerner Greenberg Stemer LLP
Post Office Box 2480
Hollywood, Florida 33022-2480
Tel: (954) 925-1100
Fax: (954) 925-1101

PAGE 10/15 * RCVD AT 11/18/2006 2:57:40 PM [Eastern Standard Time] * SVR:USPTO-EFXRF-5/19 * DNIS:2738300 * CSID:+9549251101 * DURATION (mm-ss):01-44

Claims Appendix:

1. A method for driving a semiconductor switch having load current limiting and thermal protection, a maximum load current being limited and the semiconductor switch switching off upon a predetermined upper temperature being exceeded and switching on again when a chip temperature falls below a predetermined lower temperature, which comprises the steps of:

operating the semiconductor switch in one of a normal mode and a fault mode;

operating the semiconductor switch in the fault mode upon exceeding the predetermined upper temperature; and

limiting a load current to a first maximum value in the normal mode and to a second maximum value, being lower than the first maximum value, in the fault mode.

2. The method according to claim 1, which further comprises switching on the semiconductor switch when the chip temperature falls below the predetermined lower temperature in the normal mode and in the fault mode.

3. The method according to claim 1, which further comprises switching off the semiconductor switch, when in the fault mode, if a further upper temperature is exceeded, the further upper temperature is lower than the predetermined upper temperature.

4. The method according to claim 1, which further comprises limiting the load current by actuating the semiconductor switch.

5. The method according to claim 1, which further comprises:

monitoring a voltage across a load path of the semiconductor switch; and

operating the semiconductor switch in the normal mode when a load path voltage is smaller than a predetermined threshold value.

6. A circuit configuration, comprising:

a semiconductor switch having a drive terminal and a load path;

a protective circuit connected to said drive terminal of said semiconductor switch;

a temperature sensor disposed in a region of said semiconductor switch and coupled to said protective circuit, said temeprature sensor providing a temperature measuring signal fed to said protective circuit; and

a current measuring configuration coupled to said protective circuit and generating a current measuring signal being dependent on a current across said load path of said semiconductor switch;

said protective circuit storing first and second overcurrent signals, said protective circuit assuming one of a first operating mode and a second operating mode, and, depending on a mode, said protective circuit controling said semiconductor switch according to a comparison of the current measuring signal to the first overcurrent signal or according to a comparison of the current measuring signal to the second overcurrent signal.

Evidence Appendix:

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or any other evidence has been entered by the Examiner and relied upon by appellant in the appeal.

Related Proceedings Appendix:

No prior or pending appeals, interferences or judicial proceedings are in existence which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal. Accordingly, no copies of decisions rendered by a court or the Board are available.